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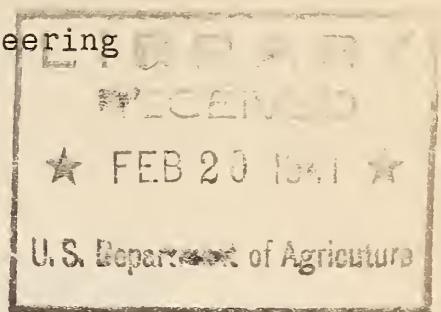


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and  
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SEA-ISLAND COTTON QUALITY AND GINNING

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By William J. Martin, Associate Cotton Technologist,  
Agricultural Marketing Service,

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Bureau of Plant Industry,

and

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### Statement of Cooperation

The seed cottons used in conducting the experiments upon which the conclusions and recommendations given in this report are based were obtained through the cooperation of the following State experiment stations:

Georgia Coastal Plain Experiment Station, Tifton, Ga.  
Wiregrass Experiment Station, Headland, Ala.,

and the following sea-island cotton producers:

#### Louisiana

W. B. Chrissp, St. Joseph;  
Joe E. King, Waverly; and  
E. B. Saunders, Tallulah;

#### Mississippi

Paul Gerard, Cleveland.

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### Contents

	Page
Status and production of sea-island cotton .....	1
Quality of sea-island cotton .....	3
Harvesting the cotton for better quality .....	5
Ginning the cotton to preserve its quality .....	7
General characteristics of roller gins .....	11
Summary .....	13

### STATUS AND PRODUCTION OF SEA-ISLAND COTTON

Years ago the production of sea-island cotton was considered one of the most profitable farming enterprises and in those areas in South Carolina, Georgia, and Florida where it could be grown, sea-island was the money crop. But with the coming of the boll weevil and in view of the fact that sea-island cotton is more vulnerable to weevil attack than most upland varieties, production of this long-staple cotton began to decline. From an annual average output of more than 90,000 bales during

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1/ Credit is due to Francis L. Gerdes, cotton technologist, Agricultural Marketing Service, and Charles A. Bennett, senior mechanical engineer, Bureau of Agricultural Chemistry and Engineering, for supervision and suggestions, and to co-workers in both agencies for their assistance.

the two decades ending with 1917 2/1, sea-island production dropped to about 50,000 bales in 1918 and to less than 7,000 bales in 1919, and 1,900 bales in 1920. For the next several years a few of the more courageous planters continued to plant sea-island cotton but with little success, and after 1923 commercial production was virtually abandoned in the United States.

With the acreage reduction and virtual abandonment of commercial production of sea-island cotton, there was no further need for roller gins. These gins were impractical for use in ginning short-staple cottons, in competition with saw gins, and the latter were, therefore, either dismantled, junked, or sold, or stored away and practically forgotten. Roller gins and roller ginning became virtually a thing of the past so far as the southeastern section of the Cotton Belt was concerned. Some of the gin equipment was transferred to the irrigated Southwest where the Egyptian cotton was being grown to replace the sea-island as the leading long staple in the United States.

About 1930, at the request of several American manufacturers, another effort was made to bring back the sea-island industry and experimental plantings were made in South Carolina, Georgia, and Florida and with fair success where the conditions were favorable. After 1934 production increased; and in 1938, 4,300 bales were reported. Most of this cotton was grown in Florida and South Georgia where exclusive sea-island communities had been established. The more progressive growers have had fair success and in 1939 sea-island planting spread into Alabama, Louisiana, Mississippi, Texas, Arkansas, and other States.

This so-called "comeback" of sea-island cotton has once again brought up the problem of harvesting, handling, and ginning. If full value is to be realized for this cotton, it must be handled carefully and ginned with roller gins. Attempts to gin it on commercial saw gins now in general use have shown that, although the lint can be separated from the seed by these gins, the staple length is decreased and the fibers become tangled and napped excessively. The action of saw gins in their present form appears to be much too severe for the long-staple sea-island.

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2/ These and subsequent figures relating to cotton production are taken from reports of the Bureau of Census. For additional information on sea-island cotton production in Florida and Georgia see the following publications:

Florida Department of Agriculture, Growing sea-island cotton under Florida conditions. Report of Works Progress Administration. (1939?)

Westbrook, E. C., Sea-island cotton culture. Ga. Univ. Agr. Ext. Cir. 268. Rev. Mar. 1938.

Ballard, W. W., Pure seed requirements in the production of sea-island cotton. Ga. Agr. Expt. Sta. Cir. 113, June 1937.

Stokes, W. E., Sea-island cotton. Univ. Fla. Agr. Expt. Sta. Press Bul. 500, Mar. 1937.

The purpose of this publication is to summarize the information which has been obtained by ginning experiments conducted on sea-island cotton at the U. S. Cotton Ginning Laboratory at Stoneville, Miss., as well as those made in the field by various Federal and cooperating State agencies.

### QUALITY OF SEA-ISLAND COTTON

Compared with upland cottons, sea-island is longer, much finer, and very silklike, often exhibiting a lustre. The general appearance of a sample of the lint is rather rough and lumpy, owing in part to being ginned on roller gins. This is largely a characteristic of the method of ginning rather than of the cotton, because the same is true of American-Egyptian cotton and even of upland cotton when it is experimentally roller ginned. It is necessary, therefore, to have a separate set of grade standards for sea-island cotton. Renewed interest in this cotton in recent years has resulted in the promulgation of new standards designed to fit the crop. On August 10, 1939, the new standards became effective, embracing six full grades, numbered from one to six. There are five half grades for qualities between the full grades, but these are descriptive, in that there are no physical standards or practical forms for them. As in the case of the universal standards for upland cottons, the sea-island grades represent color, leaf, and preparation, or surface appearance <sup>3/</sup>; and the grade of ginned lint is determined by comparison with the standards. In this manuscript, the expression "grade step" is used to mean the spread from a standard box to an adjacent descriptive type of half grade. The numerical designations for the grades are similar to those of Universal Standards in another respect, namely, No. 1 denotes better quality than No. 2, and so on. Figure 1 is a photograph of typical samples of grades 1, 2, 3, and 4, and illustrates the difference in quality between these standard grades. The higher the grade the better is the color, the lower is the foreign matter content, and the smoother is the sample from the standpoint of ginning.

The proportions of the various grades represented in the sea-island crop have fluctuated appreciably (table 1) during the past several seasons since sea-island cotton has come back into commercial production. There were also rather significant percentages of bales in practically every length category from 1-1/2 to 1-3/4 inches with generally shorter lengths in 1939. These yearly variations have been due to a number of factors, chiefly weather conditions, boll weevil infestation, and care exercised in harvesting, handling, and ginning the crop. It may be pointed out that the trend in grade is upward, the proportion of bales above No. 2 grade ranging from 17.5 percent in 1937 to 37.2 percent in 1938; and those bales of No. 4 and below ranging from 2.0 percent in 1938 to 22.5 percent in 1937. This may be due to the fact that growers and ginners are gaining experience and are improving their procedures in handling the cotton.

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<sup>3/</sup> The classification of cotton, U. S. Dept. Agr. Misc. Pub. 310, 54 pp., illus. 1938. Prepared by the Bureau of Agricultural Economics.

Table 1.--Grade and staple length of sea-island cotton ginned in the  
United States, crops of 1937-39 1/

Grade	Crop of 1937		Crop of 1938		Crop of 1939	
	Bales	Percent	Bales	Percent	Bales	Percent
1 and 1-1/2	700	17.5	1,600	37.2	645	29.4
2 and 2-1/2	1,200	30.0	2,141	49.8	1,214	55.4
3 and 3-1/2	1,100	27.5	470	10.9	301	13.7
4 and 4-1/2	700	17.5	87	2.0	32	1.5
5 and 5-1/2	200	5.0	2	2/	---	---
6	---	---	---	---	---	---
Below 6	100	2.5	---	---	---	---
All grades 3/	4,000	100.0	4,300	100.0	2,192	100.0
Staple length						
Shorter than 1-1/2	---	---	70	1.6	149	6.8
1-1/2 and 1-17/32	500	12.5	414	9.6	434	19.8
1-9/16 and 1-19/32	1,000	25.0	1,120	26.1	663	30.2
1-5/8 and 1-21/32	1,600	40.0	1,558	36.2	534	24.4
1-11/16 and 1-23/32	500	12.5	814	18.9	344	15.7
1-3/4 and longer	400	10.0	324	7.6	68	3.1
All lengths 3/	4,000	100.0	4,300	100.0	2,192	100.0

1/ Figures are for running bales (approximate average, 400 pounds).

2/ Less than 0.05 percent.

3/ As reported by the Bureau of the Census.

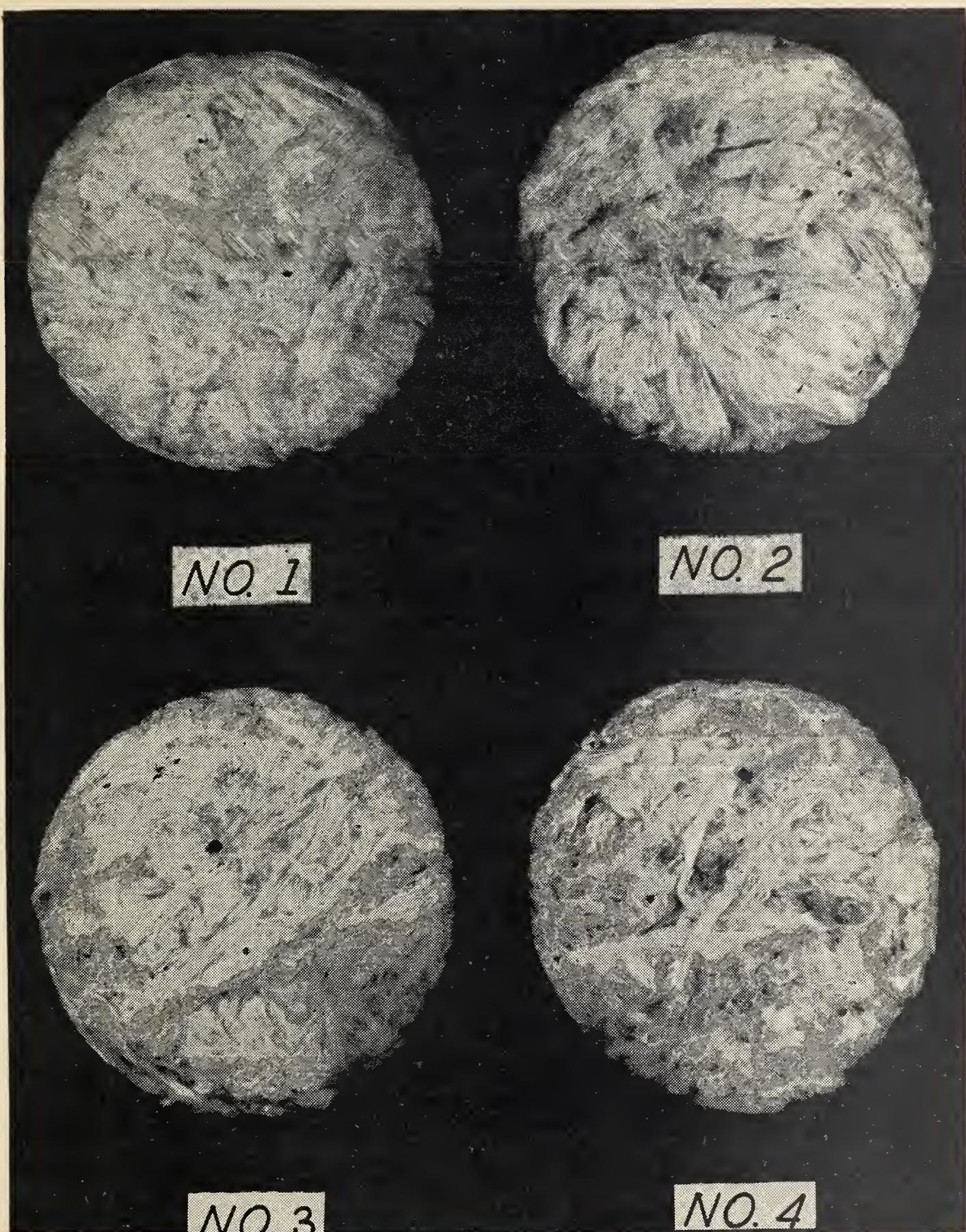


Figure 1.--Lint samples representing sea-island grades of numbers 1, 2, 3, and 4.



Bale value figures for the various grades and staple lengths of sea-island cotton are shown in table 2, based on a 400-pound gross weight bale because this is the customary and recommended size of sea-island bales in the established sea-island areas. Although figures are not available over a very long period, these give the approximate differentials that can be expected between the various qualities under the present conditions of limited sea-island production.

Table 2.--Approximate average bale value at Savannah, Ga., for selected grades and staple lengths of sea-island cotton during the season of 1939 1/

Staple length (inches)	Grades							
	1	1½	2	2½	3	3½	4	
: Dollars	: Dollars	: Dollars	: Dollars	: Dollars	: Dollars	: Dollars	: Dollars	
1-1/2	: 137.80	: 134.20	: 130.40	: 125.80	: 120.00	: 109.40	: 97.40	
	:	:	:	:	:	:	:	
1-9/16	: 143.40	: 139.60	: 135.80	: 130.40	: 127.80	: 119.80	: 110.60	
	:	:	:	:	:	:	:	
1-5/8	: 145.40	: 141.40	: 138.40	: 133.80	: 129.80	: 122.20	: 113.80	
	:	:	:	:	:	:	:	
1-11/16	: 147.80	: 143.80	: 139.60	: 135.80	: 132.20	: 124.20	: 115.80	
	:	:	:	:	:	:	:	

1/ For a 400-pound (gross weight) bale based on approximate average prices quoted for sea-island cotton landed at Savannah, Ga., during November and December, 1939.

#### HARVESTING THE COTTON FOR BETTER QUALITY

Care in harvesting and in handling has been proved to be an important factor influencing the grade of American upland cotton 4/. This becomes still more important in the case of sea-island because it is hard to clean mechanically, owing to its length of staple; and unless the grades are good, the premiums which the cotton can command will not be fully realized. In the olden days, more care was taken with the longer staples; but the procedure has changed and a more modern one is employed to get things done in a hurry, and often with harmful effects.

Sea-island cotton will, in normal years, attain a much ranker growth than will most upland cottons. For this reason the bolls near the bottom of the plant are often slow in opening fully in spite of their age. Lack of sunlight and proper opportunity to dry out will give them the appearance

4/ Gerdes, Francis L., Martin, William J., and Bennett, Charles A., Cotton harvesting and handling, U. S. Dept. Agr., 13 pp., Processed, 1938.

of frost-opened bolls, having hard locks and many immature or damaged fibers. If possible, this cotton should be picked as soon as it is sufficiently open and allowed to dry by sunning or storage; and it should be kept separate from later pickings, which ordinarily are of higher grades. Leaving this damaged cotton in the field until the last picking is preferable if there is a large quantity of cotton of good grade open. It is a recognized fact, however, that cotton pickers are reluctant to pass up any bolls that are even cracked sufficiently to get the cotton out, because they are anxious to pick for greatest weight--the basis on which they are paid. Tenants who are interested in the crop and take pride in doing the best job possible readily adopt the best methods of harvesting their cotton and thus gain the benefits of higher values for better grades (table 2).

Weather conditions have, of course, a great deal to do with the procedure that can be followed in harvesting the crop. Sea-island cotton should be allowed to dry as much as possible before it is picked; this, however, cannot be done without running the risk of bad weather. Otherwise it should be dried by sunning or by storage, because ginning it while it is green or damp is a very poor practice. When the sun-drying procedure is followed after picking, the cotton should be spread in thin layers and turned no more than is necessary, lest it become roped and tangled. Experiments at the U. S. Cotton Ginning Laboratory in 1939, with cotton that was already fairly dry, showed that manual handling while drying the cotton in the sun gave slightly lower grades. In other words, any benefits due to the drying were overshadowed by the excessive handling and turning of the cotton which gave the resulting lint a rougher appearance.

The bolls which have been damaged by weevils should be left in the field until the last picking or "scrapping-up". The cotton from such bolls is nearly always stained, damaged, and inferior in quality, and tends to lower the grade of good cotton when it is mixed. By leaving them until the very last, often after frost, they are not much worse than the frost-opened cotton and their presence will be less important. Gilmer 5/, commenting on the beneficial effects of harvesting and handling cotton carefully, states:

"This plantation produced 34 bales of cotton, averaging 370 pounds of lint. The cotton was treated for weevils and picked with special care. Ginned as picked it would have been classed as no. 1 grade, valued at approximately 25 cents per pound for the 12,600 pounds of lint. The owner, however, in an endeavor to produce super-quality cotton had this seed cotton carefully hand-sorted and all trash and weevilly locks removed. The selected cotton ginned 32 bales and the trash cotton, ginned separately, gave 2 bales. The hand-selected cotton was graded as Fancy no. 1, for which 30 cents a pound was offered, while the two bales of trashy cotton graded a poor no. 3 or a fair no. 4, worth approximately 15 cents per pound. The total lint income from the 12,600 pounds of lint without hand picking would have amounted to \$3,150. The same cotton hand picked was valued at \$3,658. The cost of hand picking was 1.5 cents per pound of lint, or \$189, leaving a profit of \$319, due solely to betterment of grade."

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5/ Gilmer, Paul M., Control of the boll weevil on sea-island cotton, Jour. of Econ. Ent., Dec. 1939.

Likewise, during the harvesting season, if a break occurs in the weather where exposure changes the grade of the cotton, previously harvested cotton should be ginned separately, if possible. The cotton that is rained on must be dried in some manner before it is ginned. Tests at the laboratory showed that ginning sea-island cotton when wet caused grade reductions of two or more grade steps, depending on the amount of moisture contained. (Figure 2). Ginning likewise becomes very difficult, the wet fibers sticking to the knives and the gin becoming "gummed up". Capacity may be lowered 50 percent or more because the gin will not deliver a continuous bat with wet cotton. Also, turnout percentage was shown by the tests to be lower with the wet cotton.

#### GINNING THE COTTON TO PRESERVE ITS QUALITY

All efforts in sea-island cotton production should be directed toward delivering the cotton to the gin in the best possible condition at the lowest possible cost. As has been pointed out, the more this cotton is handled the poorer its appearance becomes; and often the "ropiness" of the seed cotton carries over into the lint and affects its grade. When the tangles of fiber are pulled apart either in handling or ginning, neps, or small hard knots of fiber 6/, may be formed and these are very objectionable from the standpoint of spinners. They are difficult, if not impossible, to remove in the cotton mill, and produce yarns, threads, and fabrics of poor appearance, especially if the material is dyed. In fact, the breaking of staple caused by ginning sea-island cotton on saw gins might not be so objectionable, were it not for the excessive nepping of the fibers. (Figure 3). Sea-island cotton should not be ginned on saw gins if its quality is to be kept up to the standard basic to obtain the premiums which were formerly paid. In some localities where this cotton has been grown and roller gins were not available, attempts were made to gin it on saw gins. The results were very disappointing and it was reported that penalties up to 15 - 20 cents per pound were assessed because of quality damage and in some cases the lint was unsalable even on the upland market. Table 3 gives comparative data on saw and roller ginning and on the resulting quality from each method.

Although the saw-ginned lint was white, clean and smooth in surface appearance and in many cases apparently was more attractive at a glance than the roller-ginned sea-island, nevertheless a close examination of the fibers in the staple pulls revealed an abundance of "nepped" fibers. The average fiber length, as measured in the laboratory, was reduced 1/16 of an inch by saw ginning as compared to roller ginning. Also, staple length, on the average as determined by cotton classers, differed similarly and length uniformity was greatly reduced by saw ginning, as revealed by both methods of quality determination. The difference between the action of saw and roller gins with sea-island cotton is attributed not only to the influence of silkiness and fine fibers, but also to the slick seed.

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6/ Pearson, Norma L., Neps and similar imperfections in cotton. U.S. Dept. Agr. Tech. Bul. 396, 1933.

Table 3.--Comparative results from ginning sea-island cotton on saw  
and roller gins 1/

Gin	Staple							
	Per 1500 pounds seed cotton			Fiber	Commercial			
				laboratory 3/	classification			
	Ginning time	Power required	Energy consumption	Bale wt.	Mean length of var.	Coef.	Length	Remarks
	2/	2/	2/					
70" Saw Gin	43	14.0	7.4	429	1.209	35.5	49	Very neppy
40" Single Roller	291	1.4	5.1	437	1.270	32.7	51	No neps
60" Double Roller	120	3.7	5.5	436	1.275	31.1	51	No neps

1/ Averages of nine series of tests, season 1939-40.

2/ Figures are net for gin stand.

3/ Average of six series of tests, season 1939-40.

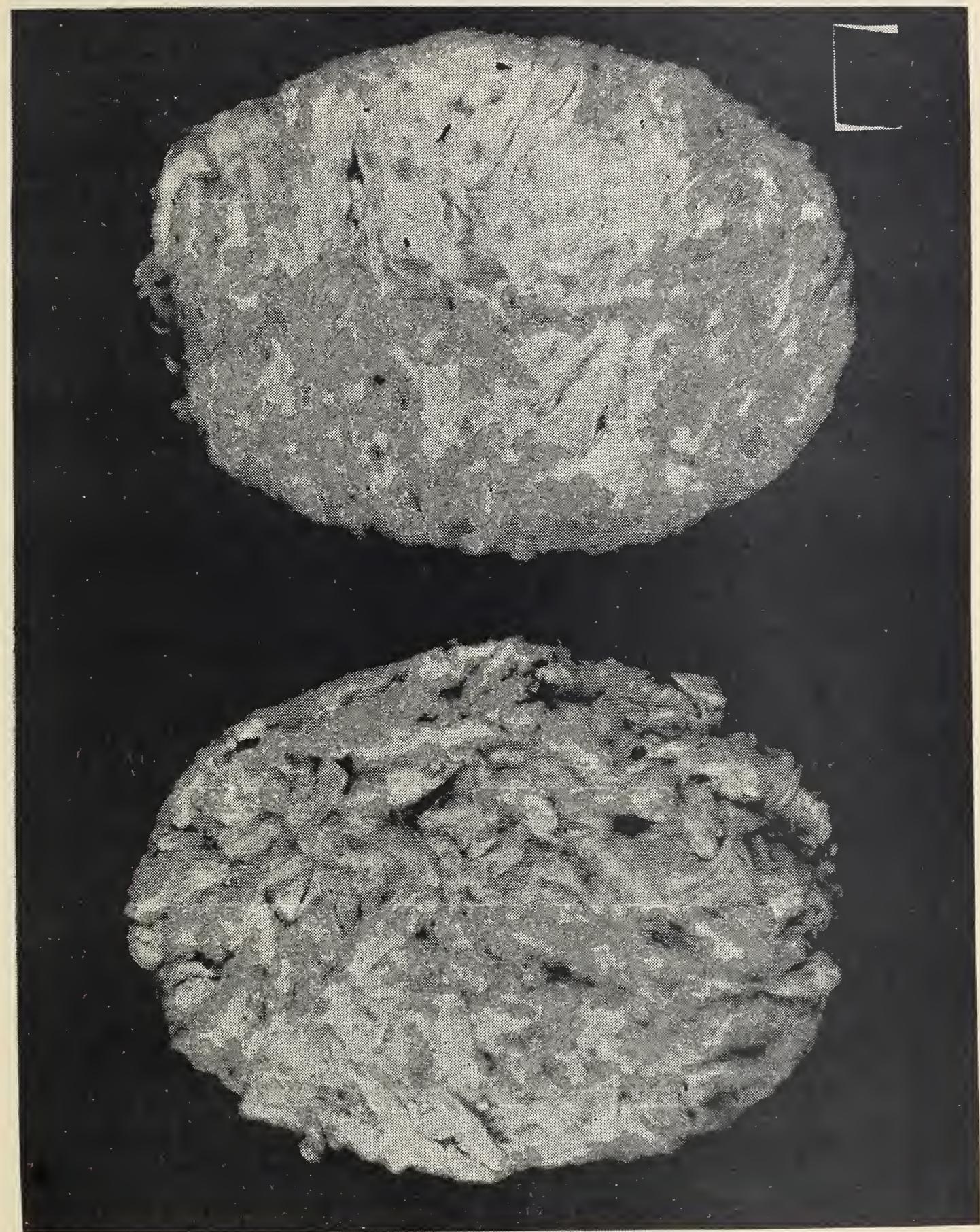


Figure 2.--Lint samples resulting from roller ginning sea-island cotton which was too wet (left) and from the same seed cotton before it got wet (right).



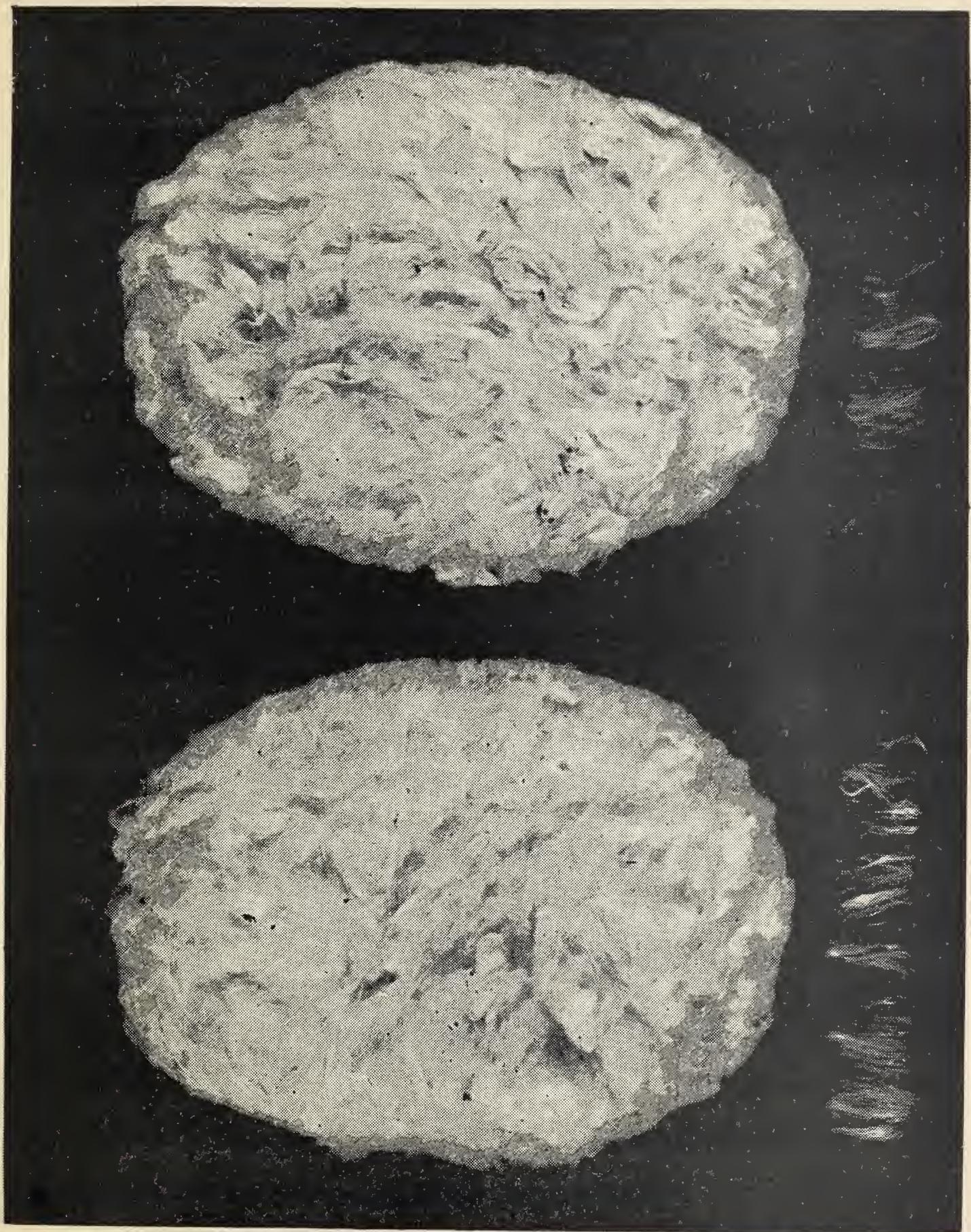


Figure 3.—Lint samples resulting from ginning sea-island cotton on a saw gin (left) and on a roller gin (right). The spread staple pulls display the relative neppiness of the samples.



A certain amount of fuzz fiber on the seed is desirable in attaining high capacity with saw gins; but when the seed are free of fuzz fiber as in the case of sea-island cotton, it is not possible to obtain satisfactory ginning. Upland cottons having staple length of as high as 1-1/2 inches have been ginned with ease on saw gins at the laboratory without serious deleterious effects on the fiber, and were smoothly ginned when in a dry condition. The fuzz characteristics of the seed, together with coarser fibers than those of sea-island, undoubtedly contributed to this success.

Old time methods of ginning the sea-island cotton involved considerable manual handling because labor was plentiful and the pneumatic systems in use today did not exist. Most of the cotton was stored until the end of the picking season and then ginned, affording it ample time to dry out and condition. Today, lack of storage facilities on most farms coupled with the urge to get cotton ginned and dispose of it are factors which contribute to the necessity of handling the seed cotton by more rapid means. Even if it is to be stored in a cotton house at a gin, the necessity of unloading and storing it pneumatically will usually prevail. Tests at the laboratory have shown that in a few cases this handling was not harmful whereas in others the more the cotton was handled the more pronounced were "neps" in the ginned lint.

Mechanical drying of sea-island cotton at the gin has not been fully investigated, particularly with the green and damp or wet cottons, because the ginning laboratory is so far from the leading producing areas. In the tests that were conducted in 1939 with fairly dry cottons, drying alone and drying in combination with cleaning by an extractor-cleaner-feeder showed an improvement of about one-half of a grade step, and the staple length was preserved. This latter probably was accomplished because no temperatures in excess of 160° F. were employed in any of the tests. It should be pointed out, however, that in this process of drying cotton, most of the moisture is removed from the lint and very little from the seed <sup>7/</sup>. Therefore, it is doubtful whether green and damp sea-island cotton with soft seed could be conditioned sufficiently by this process to eliminate the mashing of the seed, although it should improve ginning quality to some extent. This is a consideration which must be given where roller gins are involved, because the moving knife will do considerable damage to the seed, and lower the lint grade, unless seed coats are hard enough to withstand the blows. In the case of cotton which was dry but has been wet by a shower of rain or by dew, and the seed coats of which have not had time to soften, the drying process would serve to dry the lint, make it gin better, and improve the grade accordingly.

Passing sea-island cotton through cleaners has not been nearly as beneficial as in the case of shorter-staple upland cottons. As was previously pointed out, there is a tendency for the fibers to rope and tangle the more it is handled, and when these are pulled out neps may be formed,

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<sup>7/</sup>Gerdes, Francis L. and Bennett, Charles A. Effect of artificially drying seed cotton before ginning on certain quality elements of the lint and seed and on the operation of the gin stand. U. S. Dept. Agr. Tech. Bul. 508, 1936.

or the lint may appear rougher, giving a poorer grade. It also becomes more and more difficult to remove foreign matter from seed cotton as the staple length increases <sup>8/</sup>; hence sea-island, with its great length and tangling fibers, holds on to trash particles and is very hard to clean. Sand and dust are rather readily removed but leaf and larger particles cling very tenaciously to the lint.

Cooperative tests made at the U. S. Cotton Field Station, Sacaton, Ariz., by staff members of the laboratory several years ago showed that American-Egyptian cotton could be well cleaned by passage through an extractor-cleaner-feeder. This unit preserved the staple properties better than cylinder cleaners which have a tendency to rope such cotton, whereas the extracting process separated the seed cotton into almost single seed locks. These tests, like those made by others, also indicated that the then newly developed SXP cottons could be cleaned better than the Pima varieties and could be ginned smoothly at a much faster rate.

With sea-island cotton, the quality element of color also plays an important part in the effectiveness of the cleaning processes. For instance, in 1938 the cottons used in the experiments at the laboratory were of a color fairly free from boll-weevil spots and had an average foreign-matter content that was greater than the cottons used in 1939. Hence the effect of handling the cotton pneumatically and of a cleaner-extractor-feeder unit showed an improvement of two-thirds of a grade step in 1938 as compared with less than a third of a grade step for a comparable set-up in 1939. The former was accompanied by a bale-weight decrease of 6 pounds whereas the latter was only about 2 pounds. The cottons used in 1939 were of good color but had boll-weevil spots that cleaning did not overcome, and even the additional assistance of drying before and during cleaning gave only small grade improvements. As far as final grade was concerned, the 1939 cotton ginned with no handling at all was about as good as that from extensive handling, and did not have the weight loss. After the cotton was handled pneumatically, however, both cleaning and drying showed improvements as compared with the simplest handling set-up.

It was found that with dry cottons handled pneumatically, there was practically no difference between using a Rembert fan and using a separator and fan. The results with green or wet cotton could not be determined, but it is thought that sea-island cotton should not be handled by either method when it is in such a condition. Some neppling of the fibers seemed to occur with additional handling by an extractor and a drier, but there were also a few neps in control samples, showing that they may occur at any time. However, one cotton in 1939 seemed to be very resistant to neppling even though handled by the elaborate set-ups. This was probably due either to its condition or character.

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<sup>8/</sup> Gerdes, Francis L., Johnson, Arvid J., and Bennett, Charles A., Effect of cleaning seed cotton on lint quality and ginning efficiency. U.S. Dept. Agr. Tech. Bul. 663, 1939.

#### GENERAL CHARACTERISTICS OF ROLLER GINS

There are two principal types of roller gins in use today in the sea-island area; namely, the single roller of 40 inches length and the double roller of 60 inches length, as shown in figure 4. There were practically no new gins available when the production of sea-island cotton again became appreciable, and the demand for gins brought out old ones for repair. At present there are about 30 roller-ginning plants operating in the Georgia-Florida area, usually having from 2 to 4 double-roller stands each, or 6 to 12 single roller stands. Most of the gins in this area are the double-roller type but there is a tendency toward the single-roller gin for new outfits. In the Southwest, the single-roller type is used exclusively in ginning the American-Egyptian cotton. Roller-gin facilities for sea-island cotton were also available in at least one point in each of the States of Alabama, Arkansas, Louisiana, South Carolina, and Texas during the 1939 season.

As far as lint quality is concerned, there is no difference between the two types of roller gins, provided they are properly adjusted and are in good operating condition 9/. There are, however, certain features about each of the gins that cause preferences on the part of ginners. The single-roller gin, when properly adjusted, will usually stay in adjustment longer because it has fewer moving parts to get out of position. The double-roller gin is considerably harder to adjust, having six moving knives and two flexible fixed knives, the latter making it less susceptible to damage when a backlash occurs. Backlash, in the case of roller gins, will occur when a wad of ginned lint goes around the roller and is wedged under the fixed knife, springing it out of position and into the path of the moving knife. When no provision is made to take up the shock, as in the case of the single-roller gin, the moving knife often strikes the fixed knife with a force sufficient to damage it.

From the standpoint of capacity, the double-roller gin does considerably more work for the floor space it occupies. Having two rollers, both longer than the single one on the other gin, one stand will gin a bale of sea-island in about one-third the time required for the single-roller gin. This is the same ratio shown by the respective roller surfaces of the two gins. Ginning capacity depends on the proper adjustment of the knives, the speeds of the roller and the crank, and the distribution of the seed cotton over the length of the roller. It has been customary to operate at crank speeds ranging from 600 to 900 revolutions per minute in order to have as much capacity as possible. Although there is probably a point beyond which the relationship may not hold true, it was found that an increase of 15 percent in the crank speed gave a 14 percent better capacity, almost a direct ratio. Grade, staple, and other elements of quality, as well as turnout, were not affected by this increase in crank speed, showing that capacity increases were attained with no harmful effects on the ginned products.

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9/ For a detailed discussion of roller gin adjustment and operation see: Townsend, James S., Walton, Thomas C., and Martin, William J. Roller gin construction, maintenance, and operation. Processed. (In press)

The gin roller is a vital part of the gin and with its covering requires considerable attention. Walrus hide, which was used almost exclusively until recently, was thought to be unequalled for roller coverings. However, research and experiments have shown the possibility of obtaining a substitute. A packing made largely of rubber with cotton fabric has been recently tried in the laboratory and has shown considerable promise. It is much cheaper than the walrus hide, easier to obtain, and appears to have many good qualities. Results of the tests comparing this composition covering with a walrus covering are shown in table 4. The composition roller ginned faster than the walrus with only slight adverse effects on quality. The increased capacity and the slight reduction in mean length are probably due to the greater pressure on the roller that the composition covering carries. The wearing properties of the roller have not yet been determined but it can be said from observation that it appears about twice as durable.

Table 4.--Results of ginning sea-island cotton with rollers of different type coverings

60-Inch roller

Roller covering		:	:	:	:	:	:
Type	: Amount : Estimated : required ; cost <u>1/</u>	:	Capacity: Bale per minute :	Mean weight: length of var. :	Coef. : Grade :	Staple	:
			: Pounds :	Dollars : Lbs. of lint	Lbs. : Inches	Percent	Index : 1/32
							Inch
Composition	: 27	:	21.60	: 1.91	: 435 : 1.261	: 33.1	: 2.7 : 50
Walrus	: 35	:	52.50	: 1.75	: 434 : 1.271	: 32.8	: 2.5 : 50

40-Inch roller

Composition	: 18	:	14.40	: 1.46	: 436 : 1.221	: 34.9	: 2.7 : 50
Walrus	: 23	:	34.50	: 1.33	: 433 : 1.259	: 36.1	: 2.6 : 51

1/ Based on quotations at end of 1939-40 season, Walrus at \$1.50 per pound and the composition No. 40 Spider Tucks Packing at 80 cents per pound.

When a gin roller becomes sufficiently worn down or worn out, it must be recovered. Also, preliminary tests have shown that if the roller diameter decreases, its capacity diminishes as long as the roller speed remains unchanged. All rollers must be grooved in order to prevent motes and small defective seed from hanging under the fixed knife and from causing crimping or breaking of the fibers. In order to maintain the best ginning conditions, these grooves should not be allowed to become closed.

An attachment has been developed in the form of a cylindrical doffer for use with roller gins. It improves operation by assuring that lint will not pass around the roller and cause backlash and it tends to give the ginned lint a smoother appearance. It is almost essential to have a doffer working in connection with a roller covered with the composition packing. However, in areas where static electricity is prevalent, the performance of the doffer is not satisfactory unless a means of reducing or eliminating static is provided. The doffer is mounted behind the roller, driven from the roller shaft (figure 4), and its surface speed is slightly greater than that of the cotton bat; so that it has a tendency to straighten out the fibers as it pulls them from the roller. This wipes the roller clean and tends to eliminate the kinks that the roller gin puts into the fibers. This curl or kink is largely responsible for the rough, lumpy appearance of the roller-ginned cotton; and the doffer, by reducing this action to a great extent, makes it appear more like saw-ginned lint.

In order to deliver a uniform bat of ginned lint, the roller must be set with the same pressure on the fixed knife throughout its length. This pressure must be sufficient to give the gin as much capacity as possible without producing excessive heat. It is also a common practice for the operator to wipe the rollers periodically with a damp cloth to cool them and prevent overheating.

#### SUMMARY

Years ago the production of sea-island cotton was one of the most profitable farming enterprises in the southeastern areas where it could be grown. Largely because of the damaging effect of the boll weevil, it declined rapidly from an annual average of about 90,000 bales, reaching in 1924 an insignificant figure of 11 bales, and then remaining virtually extinct until its revival about 1930. At this time considerable interest was again shown in the production of sea-island cotton, both among former producers and among manufacturers of special textiles. Improved weevil control and encouragement from manufacturers tempted planters to try anew; and, since 1934, increased plantings of sea-island cotton in northern Florida and southeastern Georgia have been in evidence. In 1938, 4,300 bales were produced in this area. More recently some growers in scattered communities outside of this area have made, and are contemplating, small trial plantings of the cotton.

Sea-island cotton is inherently different from the upland types and requires more careful handling. The staple length normally ranges from 1-1/2 to 1-3/4 inches, the fibers are fine and silky, and the seed are slick and free of fuzz fiber. Because of its characteristics and the different appearance of roller-ginned sea-island lint, it has been necessary to promulgate a separate set of six standard grades for sea-island cotton, between which there are five descriptive standard half grades.

For the last several seasons the grade of the sea-island cotton produced has shown a substantial upward trend. Staple lengths were also rather well distributed through practically every length category from 1-1/2 to 1-3/4 inches. Weather conditions and boll-weevil infestation, together with methods employed in harvesting, handling, and ginning the cotton, are the principal factors that influence to some extent resulting grades as well as staple lengths.

The problems of harvesting, handling, and ginning are numerous and complicated. Experimental ginning tests at the U. S. Cotton Ginning Laboratory, Stoneville, Miss., and experiences elsewhere, have definitely shown that this fine staple cannot be properly ginned on saw gins, and, therefore, must be ginned on roller gins to preserve the inherent fiber qualities. Roller gins are used exclusively for processing sea-island cotton in Georgia and Florida, where there are about 30 roller-gin plants. In ginning sea-island cotton outside the southeastern area where roller gins were not available, some attempts have been made to use saw gins, but the results are disappointing. Value penalties from damaged quality amounted to 15 - 20 cents a pound, and sometimes the cotton was rendered unmerchantable to both sea-island and American upland buyers.

Laboratory tests showed that the mean fiber length, as measured by fiber arrays, was reduced 1/16 of an inch by saw ginning as compared with roller ginning. Also, staple length as determined by cotton classifiers differed by this amount on the average. Length uniformity was greatly reduced by saw ginning as revealed by both methods of quality analysis. The saw-ginned lint was badly nepped and tangled. Such imperfections as neps and fiber tangles are very objectionable in the manufacture of most classes of goods. They are difficult, if not impossible, to remove in the cotton mill, and produce yarns, threads, and fabrics of poor appearance, especially if the material is dyed.

It is very important in roller-ginning sea-island that the cotton be picked with care and delivered to the gin in a dry condition, and as free as possible of foreign matter and immature, weevil- and weather-damaged locks, if good quality lint and top prices are expected.

Picking tests by various individuals and agencies indicated that value benefits from quality improvements offset costs of special operations required to deliver to the gin only well-developed locks of cotton without an excess of moisture and foreign matter. Sea-island cotton should be allowed to dry as much as practicable on stalks as well as after harvesting.

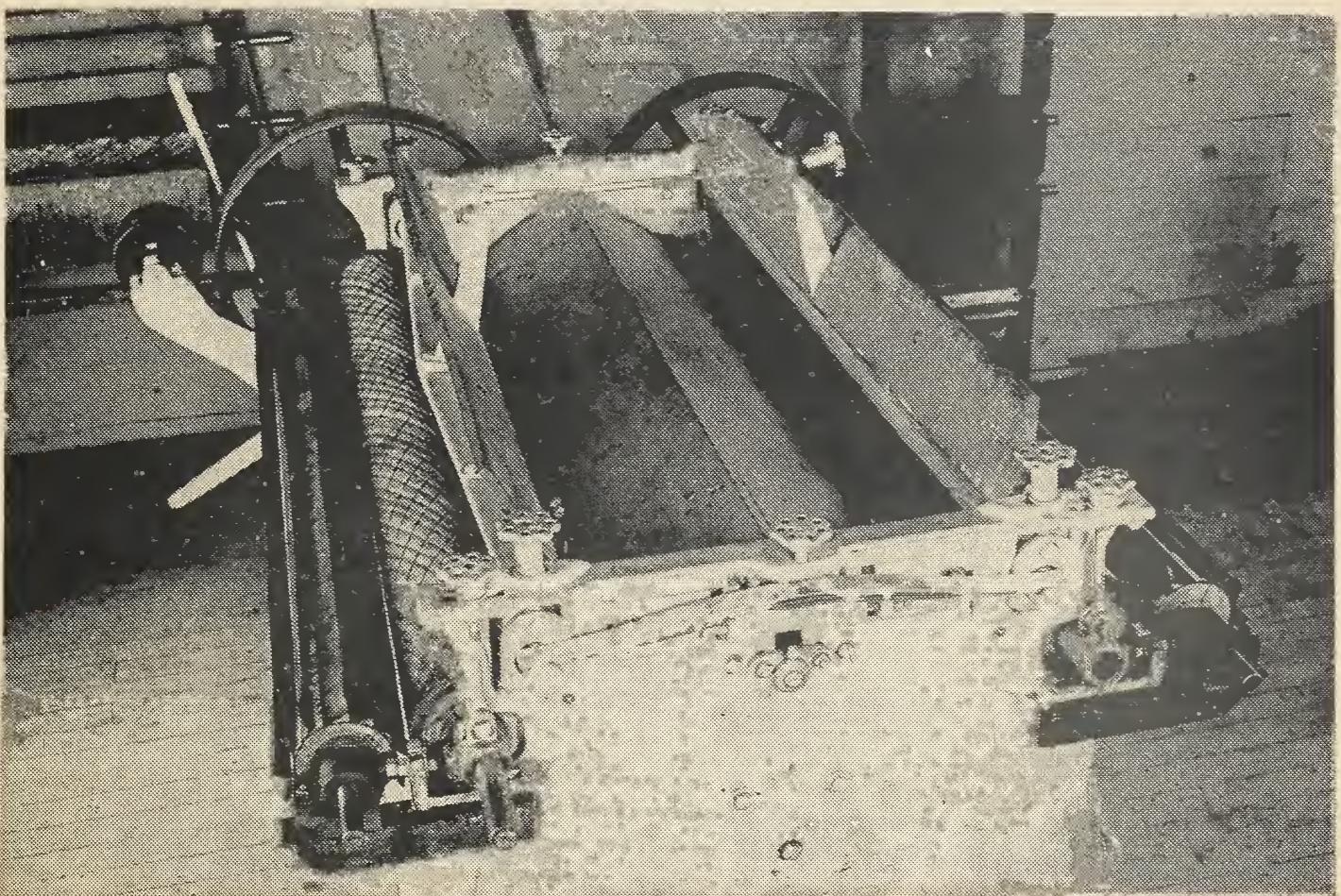
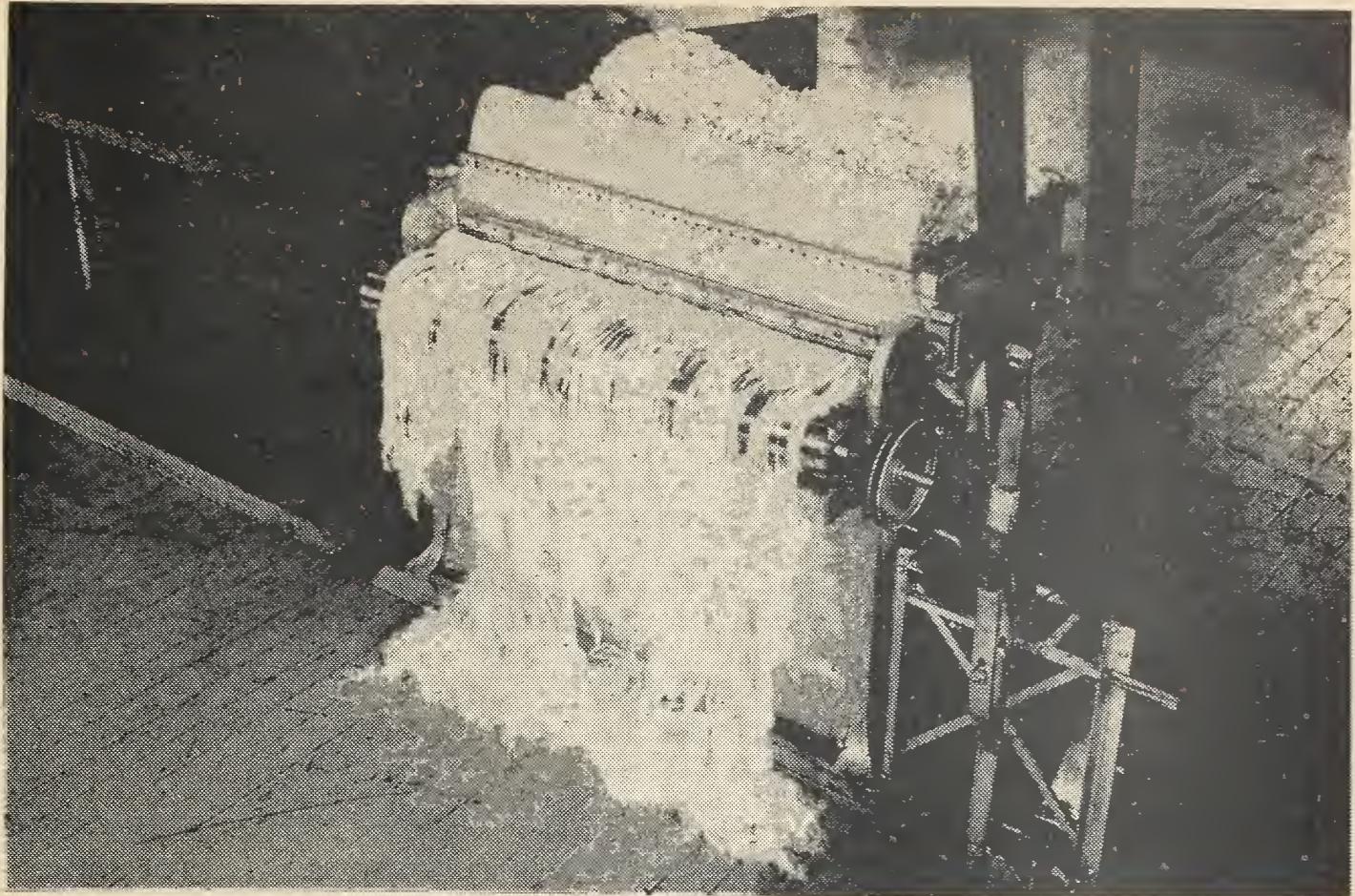


Figure 4.-- Roller gins used in the experiments at the laboratory.  
(A) 40-inch single roller gin and (B) 60-inch double roller gin.



When drying in bulk, it should be exposed in very shallow layers and handled as gently as possible. With excessive manual handling, as well as with handling by air through suction pipes from wagon or storage to the gin outfit, there is a tendency for the fibers to tangle and the lint to be rougher than would otherwise be the case. However, by passing cotton previously handled by these methods through extractor-cleaner-feeders, the quality improvements from cleaning and fluffing the fibers more than offset the adverse effects of pneumatically elevating the cotton to the gins, and increased the value of the lint.

Although grade benefits from mechanically cleaning sea-island cotton were significant in many instances, they were not nearly so great as those associated with American upland types of cotton, nor were they as much as those frequently derived from handling American-Egyptian varieties by extractor-cleaner-feeders prior to ginning. The extreme silkiness and length of sea-island cotton hinders the removal of foreign matter. Even with upland varieties, the longer the staple, the less is the tendency for the cotton to "single lock" and free the clinging trash particles.

Excess moisture in the cotton not only produces rough ginning preparation but it greatly retards ginning by causing chokages and shut-downs, and necessitates cleaning the knife and roller of adhering fibers. Drying damp cotton mechanically may be of some benefit when practicable but would hardly be effective enough on wet cotton to dry the fibers adequately without harming them or dry the seed enough to prevent them from "mashing" and causing ginning difficulties.

Imported walrus hide has been the conventional material for covering the rollers, but a new American-made composition rubber packing, tried at the laboratory, seems to give satisfactory results and almost as good quality lint. Sufficient field durability tests have not yet been made, however, to provide a basis for its final recommendation to the industry. A newly developed doffer that thoroughly removes the ginned fiber from the roller of the gin, gives promise not only of insuring continuous ginning, but also of providing smoother lint. If static electricity is prevalent, as it is in some areas, it is necessary to provide means of reducing or eliminating it if satisfactory results are to be obtained with the doffer. Other experiments are being carried on in an effort to improve roller gins, their operating efficiency, and other phases of production that influence the quality of the ginned lint.

